

Alfred ECMO Circuit Priming and Storage Guide

March 2012

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Check List for Commencement of ECMO March 2012

Assembly, Priming and Storage

Assemble full ECMO circuit (remove priming ports on access line)

Purge entire circuit with CO2 _____ (Initial/Date)

Spike Normal Saline bag and Transfer Circuit to ECMO Trolley

Prime ECMO Circuit _____ (Initial/Date)

- Transfer 0.9% normal saline from IV bag to circuit reservoir
- Remove yellow cap from oxygenator
- Prime Circuit (Release both clamps between reservoir and circuit)
- Run ECMO pump
- Remove residual CO2 from connectors and oxygenator

Prepare trolley for Storage _____ (Initial/Date)

- Recap oxygenator
- Cable tie (x3)
- Clamp return and access lines close to Lovell connections

Establish trolley in storage location _____ (Initial/Date)

- Plug in power
- Cover

Prepare circuit immediately before use: In Storage location

Add 100mls of 20% Albumin to reservoir bag _____ (Initial/Date)

Establish flow signal and circulate albumin prime _____ (Initial/Date)

Activate circuit heater. Raise water temp to 36.5 deg C. _____ (Initial/Date)

Detach power

Transfer to bedside

Prepare circuit immediately before use: At the bedside

Connect Power _____ (Initial/Date)

Start Gas Flow to the oxygenator _____ (Initial/Date)

Start pump and check heater

Clamp circuit (post oxygenator)

Connect ECMO circuit to cannulae

Go on ECMO

Restart water heater

A. Assembly and Priming (Surgically Clean Phase)

Prepare surgically clean surface. Put on mask, hair cover, sterile gown and sterile gloves. Assistant is not sterile

1. Assemble full ecmo circuit

- a. Place following sterile items on the sterile drape: 20 ml syringe, scissors, gas-line filter, line clamp, 5 x three way taps with extension tubing
- b. Open Lovell attachment and place on surface to assemble
- c. Open ECMO circuit and place on clean surface to assemble and discard paper envelop
- d. Using sterile scissors, cut out the two priming ports on distal end of access tubing
- e. Connect this end of ECMO tubing to centrifugal pump inlet (central) – to complete the ECMO circuit
- f. Attach extension loops with 3-way taps securely to Luer lock ports at points 'E', 'F', 'G', 'H', 'I', (see diagram) and ensure all taps are capped and turned off
- g. Cut ECMO circuit midpoint between blue and red markers
- h. Connect Lovell attachment to ECMO circuit. (**Y limb of Lovell attachment goes on access line** (blue markers). Other limb attaches to return line.
- i. Open all clamps on the Lovell attachment.

2. Purge entire circuit with CO₂.

- a. Place tubing clamp on green patch (M) between ports 'E' & 'F'.
- b. Open port 'E'
- c. Fit sterile 0.2 um filter to port E using piece of clean plastic tubing (3/16th inch)
- d. Assistant connects CO₂ line to .2 um filter and run CO₂ at 1.0 - 3L per min.
- e. Expel CO₂ via Lovell attachment filling line first. Then apply clamp C on filling line and Reservoir bag should start to fill
- f. Expel CO₂ via all the other 4 circuit ports (I, H, G, F) in order
- g. Primer compresses bag and ensures CO₂ venting from port 'F'
- h. Primer changes 0.2 um filter to port 'F'.
- i. Primer removes clamp from ECMO line at 'M' (indicated by green tape).
- j. Assistant briefly runs CO₂ at 2 l/min for 1.5 min (reverse flow) until CO₂ leaves port E
- k. Assistant detaches 0.2um filter from port 'F' and turns off CO₂ flow.
- l. Primer ensures excess CO₂ expelled from reservoir via the filling line,
- m. Primer closes 3- way taps at ports 'E' and 'F' and applies sterile caps to Luer connections..
- n. Assistant connects spike of the filling line to priming solution (1 L (Normal) 0.9% Saline).

B. Assembly and Priming: (Transfer to Trolley)

3. *Transfer circuit to ECMO trolley*

- a. Hang priming solution and reservoir bag from IV pole on trolley
- b. Assistant to hold access and infusion lines together to left of trolley
- c. Place Rotaflo centrifugal pump head in to external drive unit. (Do not apply ultrasound paste to flowmeter at this stage)
- d. Attach oxygenator to holder
- e. Optimize position and inclination of rotaflo remote drive. (Drive head must not be inverted; outflow line must be close to vertical to aid de-airing of pump Remote drive should not be more than 1 foot below oxygenator)
- f. Make sure access and return lines are not tangled or twisted.

4. *Prime ECMO circuit*

- a. Transfer approximately 1.5L Normal saline 0.9% from IV bag to circuit reservoir
 - i. Ensure clamp 'A' is applied and tubing clamp applied at point 'B' of circuit
 - ii. Open clamp 'C' and fill reservoir bag with approximately 1.5 L priming solution (Leave reservoir bag on trolley drip stand and apply pressure to Normal Saline 0.9% bag.)
 - iii. Once reservoir bag filled apply clamp 'C'.
- b. Commence Crystalloid Prime
 - i. Remove yellow cap at 'L' to aid de-airing process during prime.
 - ii. Check and remove all clamps from ECMO circuit.
 - iii. Open clamp 'A' then 'B' on Lovell attachment.
 - iv. Make sure access line and pump head is virtually free of bubbles by tapping (if required)
 - v. Ensure AC power indicator lit (if not check power cord connection; surge protector at the bottom of trolley; and circuit breaker at rear of pump)
 - vi. Turn on console and increase speed to 1000 rpm (flow signal is not required)
 - vii. Primer opens taps sequentially at 'E', 'F', 'G', and 'H' briefly to ensure they are primed (Use sterile gloves. No touch technique of the 3-way tap). Caps should be placed on a sterile surface while 3-way tap is handled – to prevent contamination during de-airing of side-ports. Take care not to contaminate surface
 - viii. Detach and tap oxygenator and shake to displace bubbles to apex of oxygenator
 - ix. Visible bubbles (>2mm) on the outlet side of the oxygenator can be removed via the fluid phase port (Port I)

- c. Removing small residual CO₂ bubbles from the oxygenator
 - i. Engage Oxygenator in holder
 - ii. Increase pump speed to 2000-3000 rpm (reduce if bubbles created in the reservoir bag with turbulence) and run for 5 minutes
 - iii. Partially occlude ECMO circuit with tubing clamp just distal to oxygenator to raise blood phase pressure in the oxygenator to help expel CO₂ bubbles from the oxygenator (ensure port L open)
 - iv. Check no visible bubbles remain by disengaging the oxygenator and inspecting while tapping the oxygenator with palm.

5. *Prepare trolley for storage*

- a. Replace yellow cap for apical air release port (L)
- b. Ensure caps on all taps are firm and taps are turned off to the circuit
- c. Turn pump off at front console
- d. Assistant applies cable ties to all ECMO tubing connections fashioned during the priming process (3 in total):
 - i. Between access line and pump head inlet and
 - ii. Lovell connection points (Line A and B). (All other connections should come with cable ties applied by the manufacturer.

6. *Establish trolley in storage location*

- a. Disconnect from wall power
- b. Transfer trolley to designated storage area in ICU
- c. Make sure trolley is connected to power at new location
- d. Cover whole rig with clean drape.

C. Prepare ECMO trolley and Circuit immediately before use: Initial Procedures In the storage location.**1. Add albumin**

- a. Connect 100 ml Bottle of 20% albumin to filling line (after removal of Normal Saline 0.9% bag) and insert 'vent' needle.
- b. Before releasing clamp C on the filling line, ensure the pump is not running (to prevent the possibility of massive air entrainment)
- c. Transfer albumin to reservoir bag by opening clamp C then elevating the albumin bottle and lowering the reservoir bag
- d. Re-apply Clamp C on the Filling Line once the Albumin is transferred
- e. Ensure any gas bubbles that have collected during storage are not located in the pump head
- f. Apply contact paste to flow sensor (it must completely surround the outflow tube)
- g. Start Rotaflow pump and establish flow (Clamps must be removed from line A and B)
- h. Set Rotaflow pump speed to 1000 rpm
- i. Make sure flow sensor is working properly i.e digital readout of pump flow is present. (if not reapply contact gel and try again)
- j. Check for Oxygenator leaks (inspect for leakage of priming solution)
 - i. heater connection ports on the oxygenator
 - ii. Fresh gas exhaust port

2. Activate heater/cooler.

- a. Fill heater with fluid via cap on top surface and make sure water level just below maximum
- b. Connect hosing of water heater to water connections at J and K on oxygenator (see fig 1.)
- c. Increase speed of rotaflo to 2000 rpm and run for 5 min. (water temp should settle at to 36.5 deg. C.)

3. Detach Power

- a. Turn off both rotaflo pump and water heater.
- b. Detach power cord.

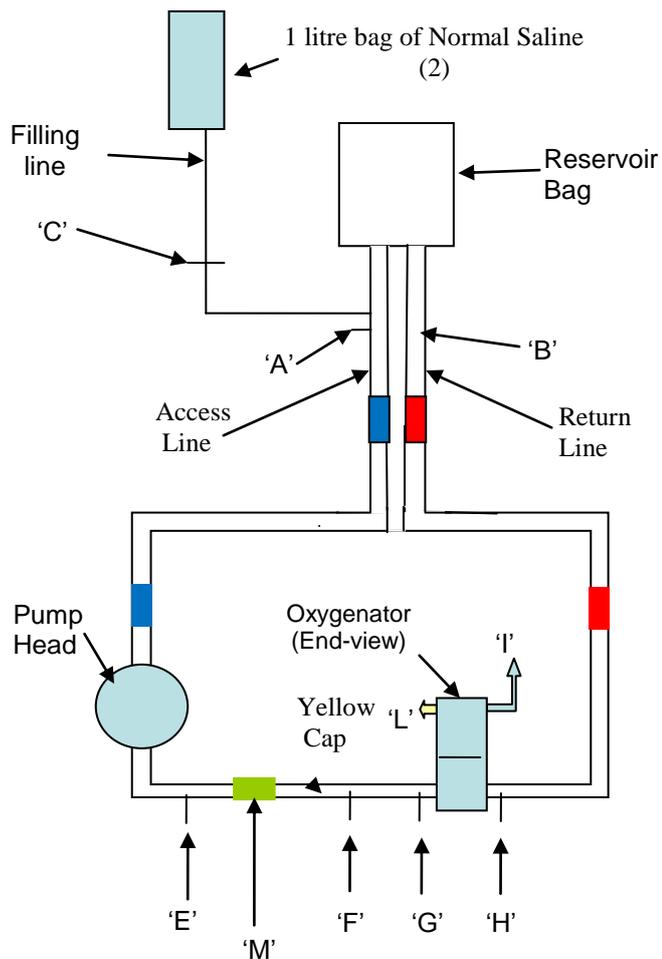
4. Transfer to cannulation room

D. Prepare ECMO trolley and Circuit immediately before use: Procedures at Patient Bedside

1. *Prepare the ECMO Trolley for active use*
 - a. Plug ECMO trolley into new power supply
 - b. Connect to room supply of oxygen and air (if blender alarms the fault must be rectified)
 - c. Briefly turn on Rotaflo pump and water heater to ensure they are both working properly then turn both of them off
 - d. Ensure (yellow) cap is on port L
 - e. Start gas flow to oxygenator at 5 l/min 100% oxygen
 - f. Apply clamps low down on both Reservoir Bag lines (A and B)
 - g. Apply safety clamp immediately post oxygenator.

E. Connect Circuit to Patient

1. *Connect distal ends of ECMO circuit to cannulae*
 - a. Assistant (non-sterile) clamps the ECMO circuit just below the connection points to the Lovell Reservoir, starting with the access side and extends the tubing toward the cannulator for cleaning with Betadine
 - b. Cannulator applies a second (sterile) clamp on the access line approximately 30cm below the Lovell connection point and cleans this distal segment (between the two clamps) with Betadine
 - c. Once thoroughly cleaned with Betadine, the Cannulator then cuts the cleaned segment (close to the non-sterile clamp) and transfers the (cleaned) tubing to the cannula (removing torsion and tangles)
 - d. Process is repeated for the Return line
 - e. Cannulator connects the cleaned segments of tubing to the appropriate cannulae using an underwater seal
2. *ECMO Initiation*
 - a. Remove clamps remaining at cannulae connection points
 - b. Ensure safety clamp (post oxygenator) remains
 - c. Ensure pump running ("Free Mode") at 1000 revs and flow signal established (should be reading 0 L/min)
 - d. Ensure gas flow to oxygenator connected
 - e. Remove safety clamp SLOWLY (especially for V-A ecmo where retrograde flow should develop) watching the saline-blood interface in the access line tubing. (if retrograde flow occurs as in V-A ecmo you should see blood entering the 'return' line)
 - f. Increase pump speed to achieve gradual inflow of the circuit prime and continue to gradually increase speed until the desired flow is achieved
 - g. Restart water heater.



Lovell Attachment

ECMO Circuit

